# EPA - Ecology meeting Upper Columbia River site Ecology Headquarters Office-Olympia, WA Mt. Adams meeting room August 21, 2002 12:30 - 2:30 p.m.

## Agenda

Introductions

Background Information and Update on CERCLA Upper Columbia River Site Investigation

EPA (20 min.)

Next steps in Superfund site assessment process

EPA (10 min.)

Site Management Options

EPA & Ecology (1 hr.)

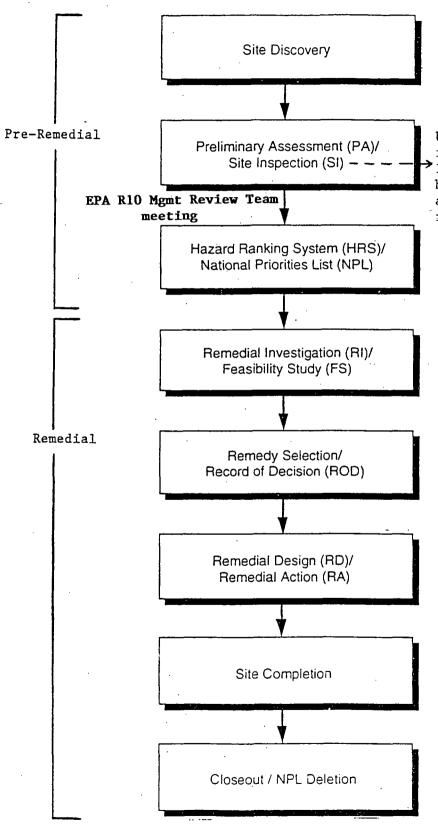
Other topics

- future meetings

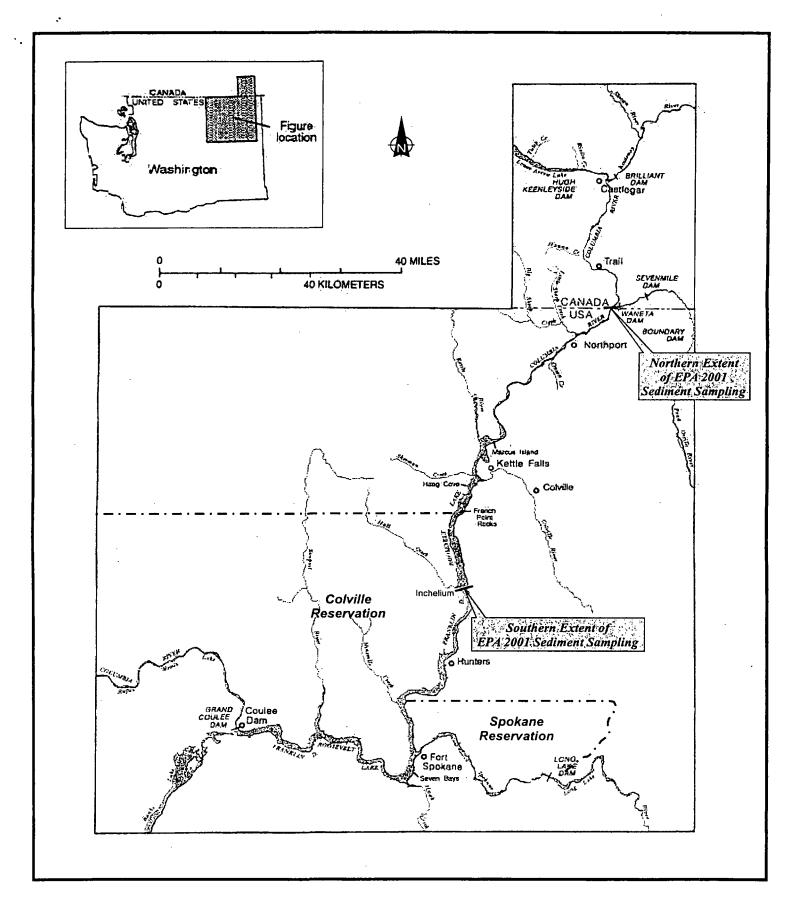
- reports



## The Superfund Process



Upper Columbia River site investigation is ongoing. Information gathered will help EPA determine whether additional detailed investigation is necessary.



UPPER COLUMBIA RIVER VICINITY MAP

## 

-	Mine/Mill Name	Mine/Mill	_	LA	T	1			ST		R	River System(s)		
ŀ	Sterling	Mine	48		10.32	_	_		32	39N	43E	Overland (1,700 ft), Pend Oreille River at River Mile 29.		
l	Metaline	Mine	48	50	32.64	117	23	24.00	32	39N	43E	Overland (1,700 ft), Pend Oreille River at River Mile 29.		
- 1	Blue Bucket	Mine	48	50	37.68	117	23	53.52	32	39N	43E	Overland (1,700 ft), Pend Oreille River at River Mile 29.		
	Bella May	Mine	48	50	53.16	117	24	16.20	29	39N	43E	Unnamed Creek, through Metaline, Pend Oreille River at River Mile 29.		
	Diamond R.	Mine	48	51	12.60	117	25	19.20	30	39N	43E	Unnamed Creek, through Metaline, Pend Oreille River at River Mile 29.		
ļ	Lehigh No. I	Mine	48	51	02.52	117	24	14.04	29	39N	43E	Unnamed Creek, through Metaline, Pend Oreille River at River Mile 29.		
- [	West Contact	Mine	48	51	07.92	117	24	56.88	30	39N	43E	Linton Creek, Pend Oreille River at River Mile 29.25.		
- 1	Lehigh No. 2	Minc	48	51	31.68	117	24	52.20	30	39N	43E	Linton Creek, Pend Orcille River at River Mile 29.25.		
t	Oriole	Mine	48	51	36.72	117	24	46.44	19	39N	43E	Linton Creek, Pend Oreille River at River Mile 29.25.		
t	Josephine	Mine	48	52	48.00	117	22	15.96	16	39N	43E	Overland, Pend Oreille River (9 miles south fo Boundary Dam).		
t	Grandview	Mine/Mill	48	52_	22.04	117	21	26.16	14,15,22,30	39N	43E	Overland, Pend Oreille River (9 miles south fo Boundary Dam).		
.	Pend Oreille	Minc/Mill	48	52	54.12	117	21	36.00	10,11,14,15	39N	43E	Overland, Pend Oreille River (9 miles south fo Boundary Dam).		
- {	Yellowhead	Mine	48	52	59.88	117	22	14.16	16	39N	43E	Overland (1,000 ft), Pend Oreille River (8 miles south of Boundary Dam).		
	Hoage	Mine	48	56	57.48	117	21	18.00	22	40N	43E	Upper Lead King Lake, Lower Lead King Lake, Everett Creek		
ſ	Lucky Strike	Mine	48	55	49.80	117	19	51.24	35	40N	43E	Overland (800 ft), Pend Oreille River (4 miles south of Boundary Dam).		
١	Lead King	Mine	48	56	16.44	117	21	13.32	27	40N	43E	Lower Lead King Lake, Everett Creek		
	Z Canyon	Mine					Π		11	40N	43E	Overland (1,400 ft), Pend Oreille River (2,500 ft north of Boundary Dam).		
	Lead Queen	Mine	_						11	40N	43E	Overland (1 mile), Pend Oreille River (1,000 ft north of Boundary Dam).		
	Lead Hill	Mine	48	58	12.72	117	11	49.56	11, 12, 13, 14,	40N	44E	Slate Creek, Pend Oreille River (5 miles south of Boundary Dam).		
			1		1	ĺ	1	١.	22, 23, 27		1			
	King Tut	Mine					Γ		2,11	40N	44E	Overland, Unnamed Tributary, Canada		
		Mine	Г						1,2	40N	44E	Overland, Lead Creek, Canada		
	Red Top						-				•	<del> </del>		

Key:

<sup>\*</sup> sampling conducted by EPA in 2001

## MINES AND MILLS

## UPPER COLUMBIA RIVER EXPANDED SITE INSPECTION STEVENS COUNTY, WASHINGTON

** Sierra Zinc/Blue Ridge Mine/Mill		OTE VENTO			<del>, ·</del>						
Magma Mine		Mine/Mill Name	LAT			LONG			S	T	R
## Farmer Mine	*	Sierra Zinc/Blue Ridge Mine/Mill	48	46	28.20	117	40	06 24		38N	41E
Maki Mine       48       50       45.60       117       36       00.00       35       39N       41         ★       Electric Pount Mine/Mill       48       52       56.28       117       32       29.04       17, 18, 39N       42         ★       Gladstone Mine/Mill       48       53       12.48       117       32       35.16       17, 18, 19, 20       39N       42         ★       Red Top Mine       48       53       12.48       117       32       33.00       17       39N       42         ★       Anderson/Calhoun Mine/Mill       48       55       35.88       117       33       52.20       25       40N       41         ★       Anderson/Calhoun Mine/Mill       48       57       0.08       117       31       12.24       30       40N       42         ★       Inequois Mine       48       57       0.08       117       32       22.92       20,29, 40N       40N       44         Lakeview Mine       48       56       44.52       117       32       22.92       20,29, 30N       40N       44         Erisco Standard Mine       48       59       34 80       117       26		Magma Mine	48	46	00.48	117	38	25 08	28	38N	41E
# Electric Point Mine/Mill		Farmer Mine	48	50	5928	117	37	17.40	34	39N	41E
★         Gladstone Mine/Mill         48         53         12.48         117         32         35.16         17, 18, 199         39N         42           Lucky Four Mine         48         52         51.6         117         32         33.00         17         39N         42           ★ Red Top Mine         48         56         35.88         117         33         52.20         25         40N         41           ★ Anderson/Calhoun Mine/Mill         48         55         09.84         117         35         28.68         2         39N         41           Lucle Mine         48         57         01.08         117         3         12.24         30         40N         42           Sulver Queen Mine         48         57         06.12         117         32         22.92         20,29,29         40N         41           Lakeview Mine         48         57         51.84         117         32         57.12         19         40N         41           Lakeview Mine         48         57         51.84         117         32         59.48         12         40N         41           Frisco Standard Mine         48         57 </th <th></th> <th>Maki Mine</th> <th>48</th> <th>50</th> <th>45.60</th> <th>117</th> <th>36</th> <th>00.00</th> <th>35</th> <th>39N</th> <th>41E</th>		Maki Mine	48	50	45.60	117	36	00.00	35	39N	41E
Lucky Four Mine	*	Electric Point Mine/Mill	48	52	56.28	117	32	29.04		39N	42E
* Red Top Mine	*	Gladstone Mine/Mill	48	53	12.48	117	32	35.16		39N	42E
* Anderson/Calhoun Mine/Mill Lucile Mine  48 57 01.08 117 3 12.24 30 40N 42  * Iroquois Mine  48 57 06.12 117 32 22.92 20,29, 40N 42  Salver Queen Mine  * Melrose Mine  48 56 44.52 117 38 45.96 28 40N 41  Lakeview Mine  48 57 51.84 117 32 57.12 19 40N 41  Jackson Mine  48 57 35.64 117 34 08.04 24 40N 41  Frisco Standard Mine  48 59 34.80 117 26 39.48 12 40N 42  Myerah Mine  United Treasure Mine  48 59 26.16 117 27 14.76 11 40N 42  Myerah Mine  48 59 21.48 117 27 51.12 11 40N 42  * Daisy Mine  48 59 21.48 117 30 6.25 23 32N 46  * Northwest Magnesite  48 15 21.94 117 43 6.25 23 32N 38N 33  * Napoleon Mine/Mill  48 44 12.1 118 6 4.32 3 37N 33  * Napoleon Mine/Mill  48 45 15 33.28 118 01 15.24 19 39N 33  Homestake No. 1 Mine  48 52 06.96 118 01 188 4 19 39N 33  Antelope Mine  48 40 8.52 17 52 33.60 3 39N 40  * New Leadville Mine  48 43 44 408.52 117 52 33.60 3 39N 33  * New Leadville Mine  48 43 54.84 117 52 33.60 3 39N 33  * Northweet Magnesite  48 51 53.28 118 01 15.24 19 39N 33  * Hubbard Mine  48 52 04.80 118 01 05.88 19-20 39N 33  * New Leadville Mine  48 53 10.99 117 47 7.47 25 40N 40  Northyport Mill  48 45 3 31.64 117 54 52.56 24 39N 46  * Van Stone Mine/Mill  48 55 23.16 117 45 15.66 30 40N 40  * LeRoi/Northport Smelter  48 52 06.24 117 41 48.48 24 39N 46  * LeRoi/Northport Smelter  48 55 23.16 117 45 15.66 30 40N 40N 40  * LeRoi/Northport Smelter  48 55 23.16 117 45 15.66 30 40N 40  * LeRoi/Northport Smelter  48 55 23.16 117 45 15.66 30 40N 40N 40  * LeRoi/Northport Smelter  48 55 23.16 117 41 48.48 24 39N 40  * LeRoi/Northport Smelter  48 50 06.24 117 41 48.48 24 39N 40  * LeRoi/Northport Smelter  48 50 06.24 117 41 48.48 24 39N 40  * LeRoi/Northport Mill  48 55 20.62 41 117 41 48.48 24 39N 40  * LeRoi/Northport Mill  48 55 20.62 41 117 41 48.48 24 39N 40  * LeRoi/Northport Mill  48 55 30.99 117 41 41 48.48 24 39N 40  * LeRoi/Northport Smelter  48 50 30.99 117 41 41 48.48 24 39N 40  * LeRoi/Northport Smelter  48 50 30.99 117 41 41 48.48 24 39N 40	ł	Lucky Four Mine	48	52	51.6	117	32	33.00	17	39N	42E
Lucile Mine	*	Red Top Mine	48	56	35.88	117	33	52.20	25	40N	41E
* Irroquois Mine  ** Irroquois Mine  ** Silver Queen Mine  ** Meltose Mine  ** Meltose Mine  ** A8 56 44.52 117 38 45.96 28 40N 41  Lakeview Mine  ** Jackson Mine  ** A8 57 51.84 117 32 57.12 19 40N 41  Jackson Mine  ** A8 57 35.64 117 34 08.04 24 40N 41  Frisco Standard Mine  ** A8 59 34.80 117 26 39.48 12 40N 42  Mycerah Mine  ** United Treasure Mine  ** Daisy Mine  ** Labar/Northwest Magnesite  ** Labar/Northwest Magnesite  ** Northwest Alloys  ** Northwest Alloys  ** Napoleon Mine/Mill  ** A8 44 12.1 118 6 4.32 3 37N 33  First Thought Mine  ** A8 59 20.4 118 9 32 7,18 39N 33  ** Napoleon Mine/Mill  ** Homestake No. 1 Mine  ** Antelope Mine  ** As 50 30.99 117 52 33.60 3 39N 33  ** Antelope Mine  ** Antelope Mine  ** Antelope Mine  ** As 50 30.99 117 52 33.60 3 39N 33  ** Antelope Mine  ** Antelope Mine  ** As 50 30.99 117 47 7.47 25 40 N 40  Northport Mill  ** Ale 50 30.99 117 47 7.47 25 40 N 40  Northport Mill  ** LeRoi/Northport Smelter  ** Black Rock Mine/Mill  ** Black Chance Mine/Mill  ** As 51 59.40 117 41 41 84.88 24 39N 44.84  ** Ale 5	*	Anderson/Calhoun Mine/Mill	48	55	09.84	117	35	28.68	2	39N	41E
** Melrose Mine		Lucile Mine	48	57	01.08	117	3	12.24	30	40N	42E
★         Melrose Mine         48         56         44.52         117         38         45.96         28         40N         41           Lakeview Mine         48         57         51.84         117         32         57.12         19         40N         41           Jackson Mine         48         57         35.64         117         34         08.04         24         40N         41           Frisco Standard Mine         48         59         34 80         117         26         39.48         12         40N         42           Mycerah Mine         48         59         21.61         117         27         51.12         11         40N         42           Losar/Northwest Magnesite         48         59         21.48         117         27         51.12         11         40N         42           LaBar/Northwest Magnesite         48         15         21.94         117         43         6.25         23         32N         46           *         LaBar/Northwest Magnesite         48         15         21.94         117         43         6.25         23         32N         46           *         Daisy Mine	*	Iroquois Minc	48	57	06.12	117	32	22.92		40N	42E
Lakeview Mine  48 57 51.84 117 32 57.12 19 40N 44   Jackson Mine  48 57 35.64 117 34 08.04 24 40N 44   Firsco Standard Mine  48 59 34.80 117 26 39.48 12 40N 44   Mycerah Mine  48 59 26.16 117 27 14.76 11 40N 44   United Treasure Mine  48 59 21.48 117 27 51.12 11 40N 44   Labar/Northwest Magnesite  48 15 21.94 117 43 6.25 23 32N 44   Northwest Alloys  48 21 26 117 50 54 11,12,   13,14    ★ Napoleon Mine/Mill 48 44 12.1 118 6 4.32 3 37N 33   First Thought Mine  48 59 20.48 118 9 32 7,18 39N 33   First Thought Mine  48 51 53.28 118 01 15.24 19 39N 33   Homestake No. 1 Mine  48 52 06.96 118 01 18.84 19 39N 33   Antelope Mine  48 52 04.80 118 01 05.88 19-20 39N 33   New Leadville Mine  48 52 04.80 118 01 05.88 19-20 39N 33   R.J. Mine  48 44 08.52 117 52 33.60 3 39N 33   R.J. Mine  48 45 38.16 117 52 33.60 3 39N 33   R.J. Mine  48 47 08.52 117 52 33.60 3 39N 33   R.J. Mine  48 48 53 09.96 118 01 37.92 7 39N 33   St. Crispen Mine 48 53 09.96 118 01 37.92 7 39N 33   St. Crispen Mine 48 53 09.99 117 47 7.47 25 40 N 40   Northport Mill 48 55 31.08 117 45 15.66 30 40 N 40   Northport Mill 48 55 23.16 117 45 15.66 30 40 N 40   Northport Mill 48 55 31.64 117 54 15.66 30 40 N 40   Northport Mill 48 55 15.96 117 54 25.56 24 39N 44   Antelope Mine 48 55 20.62 117 54 15.66 30 40 N 40   Northport Mill 48 55 31.64 117 45 15.66 30 40 N 40   Northport Mill 48 55 31.64 117 45 15.66 30 40 N 40   Northport Mill 48 55 03.08 117 45 15.66 30 40 N 40   Northport Mill 48 55 06.24 117 54 15.66 30 40 N 40   Northport Mill 48 55 06.24 117 54 15.66 30 40 N 40    Antelope Mine/Mill 48 55 06.24 117 54 14.88 24 39N 44   Antelope Mine/Mill 48 55 06.24 117 54 18.88 24 39N 44   Antelope Mine/Mill 48 55 06.24 117 41 48.48 24 39N 44   Antelope Mine/Mill 48 51 59.40 117 41 56.40 24 39N 44   Antelope Mine/Mill 48 51 59.40 117 41 56.40 24 39N 44   Antelope Mine/Mill 48 51 59.40 117 41 56.40 24 39N 44   Antelope Mine/Mill 48 51 59.40 117 41 56.40 24 39N 44   Antelope Mine Mine Antelope Mine Antelope Mine/Mill 48 51 59.40 117 41 56.40 24 39N 44   Antelop		Silver Queen Mine									
Jackson Mine       48       57       35.64       117       34       08.04       24       40N       44         Frisco Standard Mine       48       59       34.80       117       26       39.48       12       40N       42         Myeerah Mine       48       59       26.16       117       27       14.76       11       40N       42         United Treasure Mine       48       59       21.48       117       27       51.12       11       40N       42         Daisy Mine       48       22       45.8       118       4       42.6       6       33N       38         L-Bar/Northwest Magnesite       48       15       21.94       117       43       6.25       23       32N       46         Northwest Alloys       48       21       26       117       50       54       11, 12, 33N       35         Northwest Alloys       48       21       26       117       50       54       11, 12, 33N       35         18       18       21       26       117       50       54       11, 12, 33N       35         19       19       39N       36       44 <t< th=""><th>*</th><th>Melrose Mine</th><th>48</th><th>56</th><th>44.52</th><th>117</th><th>38</th><th>45.96</th><th>28</th><th>40N</th><th>41E</th></t<>	*	Melrose Mine	48	56	44.52	117	38	45.96	28	40N	41E
Frisco Standard Mine  48 59 34 80 117 26 39.48 12 40N 42  Myeerah Mine  48 59 26.16 117 27 14.76 11 40N 42  United Treasure Mine  48 59 2148 117 27 51.12 11 40N 42  Daisy Mine  48 22 45.8 118 4 42.6 6 33N 38  ★ L-Bar/Northwest Magnesite  48 15 21.94 117 43 6.25 23 32N 46  Northwest Alloys  48 21 26 117 50 54 11, 12, 33N 33  First Thought Mine  48 53 2 04 118 9 32 7, 18 39N 33  Lottie Mine  48 51 53.28 118 01 15.24 19 39N 33  Antelope Mine  48 52 06.96 118 01 18 84 19 39N 33  New Leadville Mine  48 55 15.96 117 52 03.72 32 40N 33  New Leadville Mine  48 44 08.52 117 52 33.60 3 39N 33  R.J. Mine  48 48 49 8.52 117 52 31.80 3 37N 33  R.J. Mine  48 49 85 30.99 117 47 7.47 25 40 N 46  Northport Mill  48 56 31.08 117 45 15.66 30 40 N 46  Northport Smelter  48 55 23.16 117 46 02.28 33 40N 46  Great Western Mine  48 51 59.40 117 41 84.84 24 39N 46  First Chance Mine/Mill  48 53 16.44 117 54 25.56 24 39N 46  Ancelepoint Mine/Mill  48 51 59.40 117 41 48.48 24 39N 46  Ancelepoint Mine/Mill  48 51 59.40 117 41 48.48 24 39N 46  First Chance Mine/Mill  48 51 59.40 117 41 48.48 24 39N 46  Ancelepoint Mine/Mill  48 51 59.40 117 41 48.48 24 39N 46  First Chance Mine/Mill  48 51 59.40 117 41 48.48 24 39N 46  First Chance Mine/Mill  48 51 59.40 117 41 41 48.48 24 39N 46		Lakeview Mine	48	57	51.84	117	32	57.12	19	40N	41E
Mycerah Minc       48       59       26.16       117       27       14.76       11       40N       42         Lunited Treasure Mine       48       59       21.48       117       27       51.12       11       40N       42         Last Northwest Magnesite       48       15       21.94       117       43       6.25       23       32N       46         Northwest Alloys       48       21       26       117       50       54       11, 12, 33N       35         Northwest Alloys       48       21       26       117       50       54       11, 12, 33N       35         Napoleon Mine/Mill       48       44       12.1       118       6       4.32       3       37N       35         First Thought Mine       48       53       2.04       118       9       32       7, 18       39N       33         Lottic Mine       48       51       53.28       118       01       15.24       19       39N       36         Homestake No. 1 Mine       48       52       06.96       118       01       18.84       19       39N       33         Hubbard Mine       48       52 <th></th> <td>Jackson Mine</td> <td>48</td> <td>57</td> <td>35.64</td> <td>117</td> <td>34</td> <td>08.04</td> <td>24</td> <td>40N</td> <td>41E</td>		Jackson Mine	48	57	35.64	117	34	08.04	24	40N	41E
Whited Treasure Mine       48       59       21       48       117       27       51.12       11       40N       42         ★       Daisy Mine       48       22       45.8       118       4       42       6       6       33N       38         ★       L-Bar/Northwest Magnesite       48       15       21.94       117       43       6.25       23       32N       40         ★       Northwest Alloys       48       21       26       117       50       54       11, 12, 33N       33       35         ★       Napoleon Mine/Mill       48       44       12.1       118       6       4.32       3       37N       37         First Thought Mine       48       53       2.04       118       9       32       7, 18       39N       35         Lottic Mine       48       51       53.28       118       01       15.24       19       39N       36         Homestake No. 1 Mine       48       52       06.96       118       01       18       44       19       39N       36         Hubbard Mine       48       55       15.96       117       52       33.60		Frisco Standard Mine	48	59	34 80	117	26	39.48	12	40N	42E
★       Daisy Mine       48       22       45.8       118       4       42 6       6       33N       38         ★       L-Bar/Northwest Magnesite       48       15       21.94       117       43       6.25       23       32N       40         ★       Northwest Alloys       48       21       26       117       50       54       11,12, 33N       33         *       Napoleon Mine/Mill       48       44       12.1       118       6       4.32       3       37N       35         First Thought Mine       48       53       2.04       118       9       32       7, 18       39N       35         Lottie Mine       48       51       53.28       118       01       15.24       19       39N       36         Homestake No. 1 Mine       48       52       06.96       118       01       18.84       19       39N       36         Antelope Mine       48       52       04.80       118       01       18.84       19       39N       36         Hubbard Mine       48       45       55       15.96       117       52       33.60       3       39N       39 <th></th> <th>Mycerah Mine</th> <th>48</th> <th>59</th> <th>26.16</th> <th>117</th> <th>27</th> <th>14.76</th> <th>11</th> <th>40N</th> <th>42E</th>		Mycerah Mine	48	59	26.16	117	27	14.76	11	40N	42E
★       L-Bar/Northwest Magnesite       48       15       21.94       117       43       6.25       23       32N       40         ★       Northwest Alloys       48       21       26       117       50       54       11, 12, 33N       33       35         ★       Napoleon Mine/Mill       48       44       12.1       118       6       4.32       3       37N       37         First Thought Mine       48       53       2.04       118       9       32       7, 18       39N       35         Lottie Mine       48       51       53.28       118       01       15.24       19       39N       36         Homestake No. 1 Mine       48       52       06.96       118       01       18.84       19       39N       36         Antelope Mine       48       52       04.80       118       01       05.88       19-20       39N       38         Hubbard Mine       48       55       15.96       117       52       03.72       32       40N       39         New Leadville Mine       48       44       08.52       117       52       33.60       3       39N       39		United Treasure Mine	48	59	21 48	117	27	51.12	11	40N	42E
★       Northwest Alloys       48       21       26       117       50       54       11, 12, 13, 14       33N       39         ★       Napoleon Mine/Mill       48       44       12.1       118       6       4.32       3       37N       37         First Thought Mine       48       53       2 04       118       9       32       7, 18       39N       35         Lottie Mine       48       51       53.28       118       01       15.24       19       39N       38         Homestake No. 1 Mine       48       52       06.96       118       01       18 84       19       39N       38         Antelope Mine       48       52       04.80       118       01       05 88       19-20       39N       36         Hubbard Mine       48       55       15.96       117       52       03.72       32       40N       39         New Leadville Mine       48       44       08.52       117       52       03.72       32       40N       39         R.J. Mine       48       43       54.84       117       52       33.60       3       37N       39 <t< th=""><th>*</th><th>Daisy Mine</th><th>48</th><th>22</th><th>45.8</th><th>118</th><th>4</th><th>42 6</th><th>6</th><th>33N</th><th>38E</th></t<>	*	Daisy Mine	48	22	45.8	118	4	42 6	6	33N	38E
★       Napoleon Mine/Mill       48       44       12.1       118       6       4.32       3       37N       37         First Thought Mine       48       53       2 04       118       9       32       7, 18       39N       33         Lottie Mine       48       51       53.28       118       01       15.24       19       39N       38         Homestake No. 1 Mine       48       52       06.96       118       01       18.84       19       39N       38         Antelope Mine       48       52       04.80       118       01       05.88       19-20       39N       38         Hubbard Mine       48       55       15.96       117       52       03.72       32       40N       39         New Leadville Mine       48       44       08.52       117       52       33.60       3       39N       39         R.J. Mine       48       43       54.84       117       52       31.80       3       37N       39         *       Van Stone Mine/Mill       48       45       38.16       117       45       23.76       33       38N       40         Ho	*	L-Bar/Northwest Magnesite	48	15	21.94	117	43	6.25	23	32N	40E
First Thought Mine  48 53 2 04 118 9 32 7, 18 39N 37  Lottic Mine  48 51 53.28 118 01 15.24 19 39N 38  Homestake No. 1 Mine  48 52 06.96 118 01 18 84 19 39N 38  Antelope Mine  48 52 04.80 118 01 05 88 19-20 39N 38  Hubbard Mine  48 55 15.96 117 52 03.72 32 40N 39  New Leadville Mine  48 44 08.52 117 52 33.60 3 39N 39  R.J. Mine  48 43 54.84 117 52 31.80 3 37N 39  * Van Stone Mine/Mill  48 45 38.16 117 45 23.76 33 38N 40  Hope & Twin Cabins Mine  48 56 30.99 117 47 7.47 25 40 N 40  Northport Mill  48 56 31.08 117 45 15.66 30 40 N 40  * LeRoi/Northport Smelter  48 55 23.16 117 46 02.28 33 40N 40  * LeRoi/Northport Smelter  48 52 06.24 117 41 48.48 24 39N 40  * Last Chance Mine/Mill  48 51 59.40 117 41 56.40 24 39N 40	*	Northwest Alloys	48	21	26	117	50	54		33N	39E
Lottie Mine	*	Napoleon Mine/Mill	48	44	12.1	118	6	4.32	3	37N	37E
Homestake No. 1 Mine  48 52 06.96 118 01 18 84 19 39N 38  Antelope Mine  48 52 04.80 118 01 05 88 19-20 39N 38  Hubbard Mine  48 55 15.96 117 52 03.72 32 40N 38  New Leadville Mine  48 44 08.52 117 52 33.60 3 39N 38  R.J. Mine  48 43 54.84 117 52 31.80 3 37N 39  ∀an Stone Mine/Mill  48 45 38.16 117 45 23.76 33 38N 46  Hope & Twin Cabins Mine  48 56 30.99 117 47 7.47 25 40 N 40  Northport Mill  48 56 31.08 117 45 15.66 30 40 N 40  ★ LeRoi/Northport Smelter  48 55 23.16 117 46 02.28 33 40N 46  ★ Black Rock Mine/Mill  48 53 16.44 117 54 25.56 24 39N 46  ★ Creat Western Mine  48 52 06.24 117 41 48.48 24 39N 46  ★ Last Chance Mine/Mill  48 51 59.40 117 41 56.40 24 39N 46		First Thought Mine	48	53	2 04	118	9	32	7, 18	39N	37E
Antelope Mine       48       52       04.80       118       01       05 88       19-20       39N       38         Hubbard Mine       48       55       15.96       117       52       03.72       32       40N       39         New Leadville Mine       48       44       08.52       117       52       33.60       3       39N       39         R.J. Mine       48       43       54.84       117       52       31.80       3       37N       39         Van Stone Mine/Mill       48       45       38.16       117       45       23.76       33       38N       40         Hope & Twin Cabins Mine       48       53       09.96       118       01       37.92       7       39N       38         St Crispen Mine       48       56       30.99       117       47       7.47       25       40 N       40         Northport Mill       48       56       31.08       117       45       15.66       30       40 N       40         ★       LeRoi/Northport Smelter       48       55       23.16       117       46       02.28       33       40N       40         ★ <th></th> <th>Lottie Mine</th> <th>48</th> <th>51</th> <th>53.28</th> <th>118</th> <th>01</th> <th>15.24</th> <th>19</th> <th>39N</th> <th>38E</th>		Lottie Mine	48	51	53.28	118	01	15.24	19	39N	38E
Hubbard Mine       48       55       15.96       117       52       03.72       32       40N       39         New Leadville Mine       48       44       08.52       117       52       33.60       3       39N       39         R.J. Mine       48       43       54.84       117       52       31.80       3       37N       39         Van Stone Mine/Mill       48       45       38.16       117       45       23.76       33       38N       40         Hope & Twin Cabins Mine       48       53       09.96       118       01       37.92       7       39N       38         St Crispen Mine       48       56       30.99       117       47       7.47       25       40 N       40         Northport Mill       48       56       31.08       117       45       15.66       30       40 N       40         ★       LeRoi/Northport Smelter       48       55       23.16       117       46       02.28       33       40N       40         ★       Black Rock Mine/Mill       48       53       16.44       117       54       25.56       24       39N       40		Homestake No. 1 Mine	48	52	06.96	118	01	18 84	19	39N	38E
New Leadville Mine       48       44       08.52       117       52       33.60       3       39N       39         R.J. Mine       48       43       54.84       117       52       31.80       3       37N       39         ★ Van Stone Mine/Mill       48       45       38.16       117       45       23.76       33       38N       40         Hope & Twin Cabins Mine       48       53       09.96       118       01       37.92       7       39N       38         St Crispen Mine       48       56       30.99       117       47       7.47       25       40 N       40         Northport Mill       48       56       31.08       117       45       15.66       30       40 N       40         ★ EROi/Northport Smelter       48       55       23.16       117       46       02.28       33       40N       40         ★ Black Rock Mine/Mill       48       53       16.44       117       54       25.56       24       39N       40         ★ Creat Western Mine       48       51       59.40       117       41       48.48       24       39N       40         ★ Las		Antelope Mine	48	52	04.80	118	01	05 88	19-20	39N	38E
R.J. Mine  48 43 54.84 117 52 31.80 3 37N 39  ★ Van Stone Mine/Mill  Hope & Twin Cabins Mine  48 53 09.96 118 01 37.92 7 39N 38  St Crispen Mine  48 56 30.99 117 47 7.47 25 40 N 40  Northport Mill  48 56 31.08 117 45 15.66 30 40 N 40  ★ LeRoi/Northport Smelter  48 55 23.16 117 46 02.28 33 40N 40  ★ Black Rock Mine/Mill  48 53 16.44 117 54 25.56 24 39N 40  ★ Creat Western Mine  48 52 06.24 117 41 48.48 24 39N 40  ★ Last Chance Mine/Mill  48 51 59.40 117 41 56.40 24 39N 40		Hubbard Mine	48	55	15.96	117	52	03.72	32	40N	39E
★       Van Stone Mine/Mill       48       45       38.16       117       45       23.76       33       38N       40         Hope & Twin Cabins Mine       48       53       09.96       118       01       37.92       7       39N       38         St Crispen Mine       48       56       30.99       117       47       7.47       25       40 N       40         Northport Mill       48       56       31.08       117       45       15.66       30       40 N       40         ★       LeRoi/Northport Smelter       48       55       23.16       117       46       02.28       33       40N       40         ★       Black Rock Mine/Mill       48       53       16.44       117       54       25.56       24       39N       40         ★       Creat Western Mine       48       52       06.24       117       41       48.48       24       39N       40         ★       Last Chance Mine/Mill       48       51       59.40       117       41       56.40       24       39N       40		New Leadville Mine	48	44	08.52	117	52	33.60	3	39N	39E
Hope & Twin Cabins Mine  48 53 09.96 118 01 37.92 7 39N 38 St Crispen Mine  48 56 30.99 117 47 7.47 25 40 N 40 Northport Mill  48 56 31.08 117 45 15.66 30 40 N 40  ★ LeRoi/Northport Smelter  48 55 23.16 117 46 02.28 33 40N 40  ★ Black Rock Mine/Mill  48 53 16.44 117 54 25.56 24 39N 40  ★ Great Western Mine  48 52 06.24 117 41 48.48 24 39N 40  ★ Last Chance Mine/Mill  48 51 59.40 117 41 56.40 24 39N 40		R.J. Mine	48	43	54.84	117	52	31.80	3	37N	39E
St Crispen Mine       48       56       30.99       117       47       7.47       25       40 N       40 N         Northport Mill       48       56       31.08       117       45       15.66       30       40 N       40 N         ★       LeRoi/Northport Smelter       48       55       23.16       117       46       02.28       33       40N       40         ★       Black Rock Mine/Mill       48       53       16.44       117       54       25.56       24       39N       40         ★       Great Western Mine       48       52       06.24       117       41       48.48       24       39N       40         ★       Last Chance Mine/Mill       48       51       59.40       117       41       56.40       24       39N       40	*	Van Stone Mine/Mill	48	45	38.16	117	45	23.76	33	38N	40E
Northport Mill       48       56       31.08       117       45       15.66       30       40 N       40 N         ★       LeRoi/Northport Smelter       48       55       23.16       117       46       02.28       33       40N       40         ★       Black Rock Mine/Mill       48       53       16.44       117       54       25.56       24       39N       40         ★       Great Western Mine       48       52       06.24       117       41       48.48       24       39N       40         ★       Last Chance Mine/Mill       48       51       59.40       117       41       56.40       24       39N       40		Hope & Twin Cabins Mine	48	53	09.96	118	01	37.92	7	39N	38E
★       LeRoi/Northport Smelter       48       55       23.16       117       46       02.28       33       40N       40         ★       Black Rock Mine/Mill       48       53       16.44       117       54       25.56       24       39N       40         ★       Great Western Mine       48       52       06.24       117       41       48.48       24       39N       40         ★       Last Chance Mine/Mill       48       51       59.40       117       41       56.40       24       39N       40		St Crispen Mine	48	56	30.99	117	47	7.47	25	40 N	40 E
★       Black Rock Mine/Mill       48       53       16.44       117       54       25.56       24       39N       40         ★       Great Western Mine       48       52       06.24       117       41       48.48       24       39N       40         ★       Last Chance Mine/Mill       48       51       59.40       117       41       56.40       24       39N       40		Northport Mill	48	56	31.08	117	45	15.66	30	40 N	40 E
★       Great Western Mine       48       52       06.24       117       41       48.48       24       39N       40         ★       Last Chance Mine/Mill       48       51       59.40       117       41       56.40       24       39N       40	*	LeRoi/Northport Smelter	48	55	23.16	117	46	02.28	33	40N	40E
★ Last Chance Mine/Mill 48 51 59.40 117 41 56.40 24 39N 40	*	Black Rock Mine/Mill	48	53	16.44	117	54	25.56	24	39N	40E
	*	Great Western Mine	48	52	06.24	117	41	48.48	24	39N	40E
		41	40	lsı l	50.40	117	41	56.40	24	20N	40E
★ Deep Creek Mine 48 51 48.96 117 42 54.36 26 39N 40	*	Last Chance Mine/Mill	48	21	35.40	117	41	30.40	24	3711	40E
* Copper King Mine 48 46 51.60 117 39 12.24 32 33N 41		Last Chance Mine/Mill Deep Creek Mine	_	51							40E 40E

\* Bonanza Mill

key:
\* sampling conducted by EPA

### **ABSTRACT**

Fumed tail slag was collected from Cominco's lead/zinc smelter located at Trail, B.C. and tested for toxicity using five species of aquatic organisms representative of different levels of the food chain: Selenastrum capricornutum, a unicellular green alga; Daphnia magna, a zooplanktonic species; Hyalella azteca, an epibenthic invertebrate; Chironomus tentans, a benthic invertebrate; and rainbow trout (Oncorhynchus mykiss) fingerlings. Slag was found to be detrimental to all species studied. Results of ICP scans on bioassay water collected at the completion of each bioassay indicated that elevated levels of copper and zinc may have been at least partly responsible for the acute toxicity observed. Results of histological analyses performed on rainbow trout exposed to slag indicated that slag also caused mortality by abrading delicate exposed surfaces such as gills.

July 1992

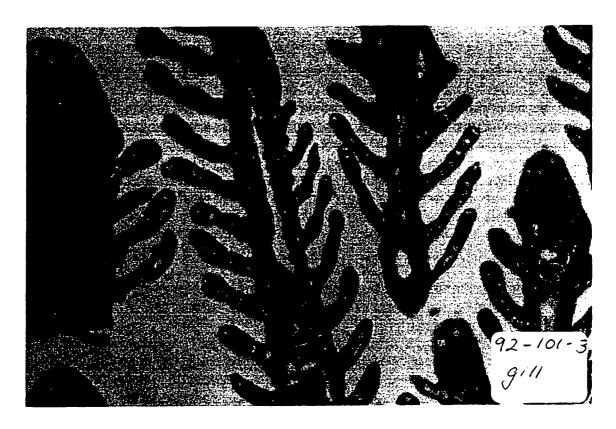
# SURVIVAL AND WATER QUALITY RESULTS OF BIOASSAYS ON FIVE SPECIES OF AQUATIC ORGANISMS EXPOSED TO SLAG FROM COMINCO'S TRAIL OPERATIONS

by

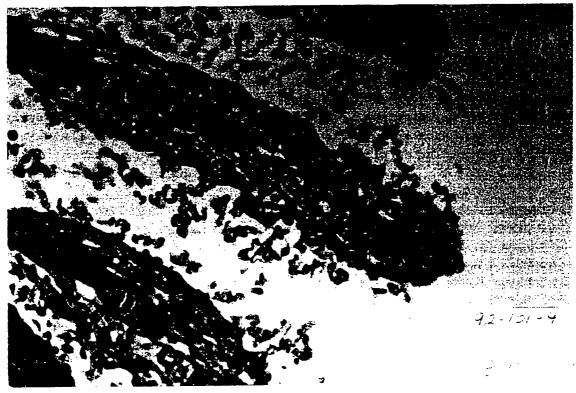
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Figure 1 Cross Sections of Rainbow Trout Gills Showing Damage Caused by Abrasion



## 1. a) Gill from Control fish.



1. b) Gill from fish exposed to slag (Tap 1/2) for 7 hours Note the eroded lamellae of gills exposed to slag.

# COMINCO SLAG IN LAKE ROOSEVELT

**Review of Current Data** 

## Prepared by:

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DECEMBER 1993



### **Conclusions**

Findings from the above recent studies contradict previous conclusions, i.e. that Cominco slag leaches little and is biologically inert. These recent laboratory studies confirm that Cominco slag is toxic to all aquatic test species due to the leaching of significant amounts of copper and zinc and/or physical abrasion of vital tissues such as gills. Nener (1992) observed that increasing concentrations of dissolved metals in bioassay supernatant was associated with increases in bioassay duration (10 days vs 96 and 48 hours). This suggests that slag discharged to the Columbia River and Lake Roosevelt may continue to leach metals for a period of time. The findings from these studies suggest that discharge of Cominco slag into the Columbia River and ultimately Lake Roosevelt may have detrimental effects on the lake's aquatic ecosystem due to leaching of copper and zinc and from the physical characteristics of fumed slag.

Human exposure to fumed Cominco slag on beaches of Lake Roosevelt may result from inhalation, dermal contact, ingestion of lake water, and direct ingestion of slag material. The direct ingestion of slag is believed to be the exposure route of primary human health concern. Although children, and to a lesser extent adults, may inadvertently consume small amounts of slag from time to time, metal concentrations in slag are not sufficiently high to result in acute adverse health effects. It is also unlikely that a sufficient quantity of slag (greater than four grams per month, the volume of about four pennies) would be chronically consumed by a child so as to pose a significant long-term health concern. However, this assessment is based on many assumptions and does not account for an individual's total metal exposure from all routes, including drinking water and household dust. Additionally, the reduced leachability of beach slag, as a result of weathering, was also not addressed.

In summary, slag contains various metals as do non-slag contaminated sediments and soils. Recent studies indicate that slag is toxic to a variety of aquatic organisms and may be impacting the aquatic ecosystem in the Columbia River near the Canadian boarder. Available information is not sufficient to determine the amount of a metal which would be leached from slag found on Lake Roosevelt beaches, as it passes through the human digestive tract. If one assumes that the full concentration of each metal identified in fumed Cominco slag is available for gastro-intestinal absorption following human ingestion, then the metal of greatest concern is copper. Based on this scenario, a child could consume as much as four grams of slag per month or about the same volume as four pennies without experiencing adverse health impacts.

## EPA Upper Columbia River Site Investigation 2001 Sampling Event River sediment sample results Range of detections, ppm

Substance	Inchelium to Kettle Falls	Kettle Falls to Northport	Northport to US-CAN border	Consensus-Based Threshold Effects Concentrations (TECs)	WA State Freshwater Sediment Quality Values (FSQVs)	Background Concentration, Lower Arrow Lake Ecology 2001	
Arsenic	non detect - 2.8	3.4 - 26.9	7.6 - 42.8	9.8	57	2.0 U (non detect)	
Cadmium	0.12 - 11.1	non detect - 7.2	non detect - 4.8	0.99	5.1	0.44	
Copper	10.4 - 111	18.1 - 1,550	245 - 3,300	32	390	3.6	
Lead	6.2 - 841	6.7 - 1,590	199 - 512	36	450	12	
Mercury	non detect - 1.7	non detect - 1.2	non detect - 0.29	0.18	0.41	0.0004 U	
Zinc	36.8 - 1,460	42.3 - 24,900	2,430 - 22,300	121	410	26.9	

FSQVs and TECs represent the spectrum of both moderately conservative and highly conservative guidelines to evaluate the relationship between metals concentrations and the possibility of effects to benthic life (Johnson et al. 2000; Serdar et al. 2000)

TEC = Concentration below which harmful effects on sediment dwelling organisms are not expected to occur.